SHARK®200

UPGRADABLE FULLY FEATURED POWER & ENERGY METER

Revenue Grade with Advanced I/O and Power Quality

Shark® 200T
Transducer Only

Shark® 200
Meter/Transducer

c UL us LISTED
ELECTRICAL & ELECTRONIC MEASURING & TEST EQUIP.
22CZ

ISO 9001 : 2000

www.electroind.com

From Simple to Sophisticated

- Simple Multifunction Meter: V-Switch™ Key 1
- Historical Data-logging: V-Switch™ Key 2
- Advanced Power Quality Waveform Recorder: V-Switch™ Keys 5 or 6

Industry Leading Performance

- Highly Accurate Metering Technology
- Expandable I/O with 100BaseT Ethernet
- V-Switch™ Technology Upgrade
- Extensive Data Logging
- Power Quality Recording
- Up to 512 Samples/Cycle

Electro Industries/GaugeTech
The Leader in Power Monitoring and Control

HIGH PERFORMANCE WAVEFORM RECORDING

Basic Features Summary

- **0.2% Class Revenue Certifiable Energy and Demand Metering**
- **Meets ANSI C12.20 and IEC 687 (0.2% Class)**
- **Multifunction Measurement**
- **3 Line .56" LED display**
- **% of Load Bar for Analog Perception**
- **Standard RS485 (Modbus and DNP 3.0)**
- **IrDA Port for PDA Read**
- **Ultra-Compact**
- **Fits both ANSI and DIN Cutouts**

Advanced Features Summary

- **High Performance Waveform Recorder**
- **Up to 4 Megabytes Flash for Historical Data Logging & PQ Recording**
- **Extremely Configurable Field Upgradable I/O**
- **100BaseT Ethernet – Rapid Response™ Technology**
- **V-Switch™ Technology**

APPLICATIONS

- **Utility Metering**
- **Substations**
- **Power Generation**
- **Submetering**
- **Power Quality Studies**
- **Load Studies**
- **Commercial Metering**
- **Industrial Metering**
- **Campus Metering**
- **Analog Meter Replacement**
- **Disturbance Recording**
- **Voltage Recording**

ACCURACY AND UPGRADE SWITCHES

Electro Industries introduces a new standard in panel mounted power metering. The Shark® 200 metering system is an ultra-compact power metering device providing industry leading revenue metering functionality combined with advanced data-logging, power quality, communication and I/O traditionally found only in high performance and high cost systems. This product is designed to incorporate advanced features in a cost effective, small package for large scale, low cost deployment within an electrical distribution system.

V-Switch™ Technology

The Shark® 200 meter is equipped with EIG's exclusive V-Switch™ technology. This technology allows users to upgrade and add features by using communication commands as needed, even after the meter is installed.

V-Switches Include the Following Features:

Feature	V1	V2	V3	V4	V5	V6
Multifunction Measurement with I/O Expansion	✓	✓	✓	✓	✓	✓
2 Megabytes Data-Logging		✓	✓	✓		
3 Megabytes Data-Logging					✓	
4 Megabytes Data-Logging						✓
Harmonic Analysis			✓	✓	✓	✓
Limit and Control Functions				✓	✓	✓
64 Samples per Cycle Waveform Recorder					✓	
512 Samples per Cycle Waveform Recorder						✓

ACCURACY

Measured Parameters	Accuracy %	Display Range
Voltage L-N	0.1%	0-9999 Scalable V or kV
Voltage L-L	0.2%	0-9999 V or kV Scalable
Current	0.1%	0-9999 Amps or kAmps
+/- Watts	0.2%	0-9999 Watts, kWatts, MWatts
+/-Wh	0.2%	5 to 8 Digits Programmable
+/-VARs	0.2%	0-9999 VARs, kVARs, MVARs
+/-VARh	0.2%	5 to 8 Digits Programmable
VA	0.2%	0-9999 VA, kVA, MVA
VAh	0.2%	5 to 8 Digits Programmable
PF	0.2%	+/- 0.5 to 1.0
Frequency	+/- 0.03 Hz	45 to 65 Hz
%THD	+/- 2.0%	1 to 99.99%
% Load Bar	+/- 1 Segment	(0.005 to 6) A

Note: *Applies to 3 element WYE and 2 element Delta connections. See full accuracy specifications in Shark® 200 Meter User Manual. Neutral current 2% accuracy.*

Traceable Watt-Hour Test Pulse for Accuracy Verification

The Shark® 200 device is a traceable revenue meter. It contains a utility grade test pulse allowing power providers to verify and confirm that the meter is performing to its rated accuracy. This is an essential feature required of all billing grade meters.

- **Utility Block and Rolling Average Demand**
- **Historical Load Profiling**

EXTENSIVE DATA-LOGGING CAPABILITY (V2 and Higher)

The Shark®200 meter offers the capability of having 2 Megabytes of data-logging to be used for historical trends, limit alarms, I/O changes and sequence of events. The unit has a real-time clock that allows for time stamping of all the data in the instrument when log events are created.

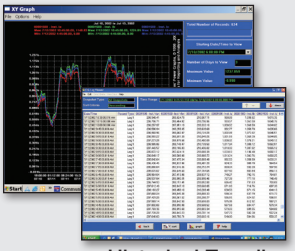
Historical Logs

- 3 Assignable Historical Logs
- Independently Program Trending Profiles
- Up to 64 Parameters per Log

System Events Log

To protect critical billing information, the meter records and logs the following with a time stamp:

- Demand Resets
- Password Requests
- System Startup
- Energy Resets
- Log Resets
- Log Reads
- Programmable Settings Changes



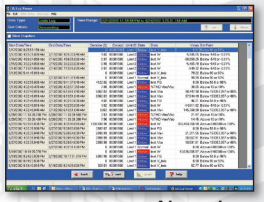
Historical Trending

I/O Change Log

- Provides a Time Stamped Log of any Relay Output
- Provides a Time Stamped Log of Input Status Changes
- 2048 Events Available

Limit/Alarm Log

- Provides Magnitude and Duration of an Event
- Includes Time Stamps and Alarm Value
- 2048 Events Available



Alarm Log

Limits Alarms and Control Capability (V4 Option)

Limit Events

- Any measured parameter
- Up to 16 Limits
- Voltage Imbalance
- Current Imbalance
- Based on % of full scale settings

Limit Set Up

HIGH PERFORMANCE POWER QUALITY ANALYSIS (V5 AND V6)

Simultaneous Voltage and Current Waveform Recorder

The unit records up to 512 samples per cycle for a voltage sag or swell or a current fault event. The unit provides the following pre-event and post-event recording capability. Waveform records are programmable to the desired sampling rate. V5 provides up to 3 Megabytes storage and V6 provides a total of 4 Megabytes.

The meter's advanced DSP design allows Power Quality triggers to be based on a 1 cycle updated RMS. Up to 170 events can be stored until the memory fills. The meter stores waveform data in a first-in/first-out circular buffer to insure data is always recording.

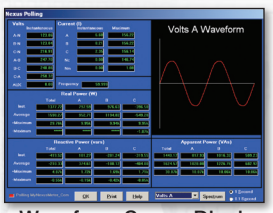
Optional Waveform Recorder

	Samples per Cycle	Pre Event Cycles	Post Event Cycles	Max Waveform per Event	Number of Stored
V5	16	32	96	256	85
	32	16	48	128	85
	64	8	24	64	85
V6	128	4	12	32	170
	256	2	6	16	170
	512	1	3	8	170

Note: Sampling rate based on 60Hz. 50Hz systems, divide sample rate by 0.83.

Waveform Scope

The unit uniquely offers a waveform scope to view the real time waveform for voltage and current. Waveform scope allows the meter to be used as a basic oscilloscope throughout a power system.



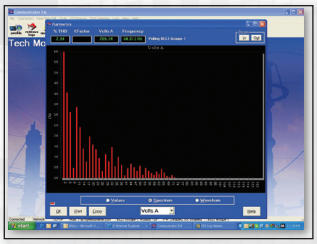
Waveform Scope Display

Independent CBEMA Log Plotting

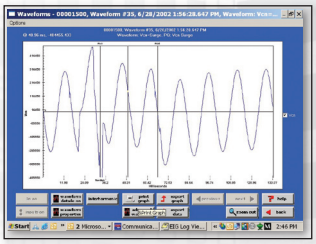
The meter stores an independent CBEMA log for magnitude and duration of voltage events. This allows a user to quickly view total surges, total sags and duration without retrieving waveform data.

Harmonic Recording to the 40th Order

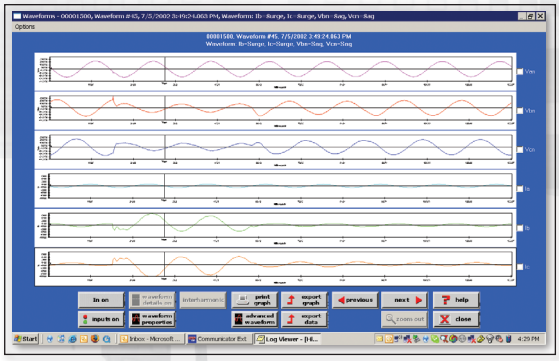
The Shark® 200 meter provides advanced harmonic analysis to the 40th order for each voltage and current channel in real time. Using the stored waveforms, harmonic analysis is available to the 255th order.



Harmonic Spectrum (40th Order)



Waveform Zoomed



6 Channels of Waveforms

STANDARD COMMUNICATION CAPABILITY

The Shark® 200 meter provides two independent communication ports with advanced features.

Rear Mounted Serial Port with KYZ Pulse

- RS485 - This port allows RS485 communication using Modbus or DNP 3.0 Protocols. Baud rates are from 9600 to 57.6k.
- KYZ Pulse - In addition to the RS485, the meter also includes Pulse Outputs mapped to absolute energy.

Front Mounted IrDA Communication

Uniquely, the Shark® meter also has an optical IrDA port, allowing the unit to be set up and programmed using a PDA or remote laptop without need for a communication cable. Just point at the meter with an IrDA-equipped PC or PDA and configure it. COPILOT EXT is a Windows CE software package that allows you configure the meter and poll readings.

FIELD EXPANDABLE I/O AND COMMUNICATION CAPABILITIES

The Shark® 200 meter offers unequaled I/O expandability. Using the two universal option slots, the unit can easily be configured to accept new I/O cards even after installation. The unit auto-detects installed I/O option cards. Up to 2 cards of any type can be used per meter.

1. INP100S: 100BaseT Ethernet Capability

The meter can provide 100BaseT Ethernet functionality. Using this card, a user can connect to 12 simultaneous Modbus TCP/IP connections.

2. 1mAOS: Four Channel Bi-directional 0-1mA Outputs

- Assignable to any parameter
- 0.1% of full scale
- 0 to 10K Ohms, no accuracy losses
- Range +/- 1.20mA

3. 20mAOS: Four Channel 4-20mA Outputs

- Assignable to any parameter
- 0.1% of full scale
- 0 – 500 Ohms, no accuracy losses
- Loop Powered using up to 24 Volts DC

4. RO1S: Two Relay Outputs / Two Status Inputs

- 250VAC/30VDC - 5A Relays, Form C
- Trigger on user set alarms
- Set delays and reset delays
- Status Inputs – Wet / Dry Auto Detect (Up to 150 VDC)
- Must be used with V4 or higher V-Switch™ option for limit based alarms and control

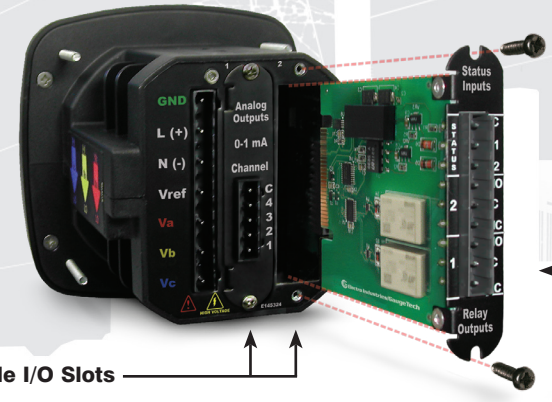
5. PO1S: Four Pulse Outputs / Four Status Inputs

- Programmable to any energy parameter and pulse value
- Form A: Normally open contacts
- Also used for End of Interval pulse
- Can function for manual relay control and limit based control (V4-V6 Options)
- 120mA continuous load current
- Status Inputs - Wet/Dry Auto Detect (Up to 150 VDC)

6. FOVPS or FOSTS: Fiber Optic Card

- EIG's exclusive Fiber Optic Daisy Chain switchable built-in logic mimics RS485 half duplex bus, allowing you to daisy chain meters for lower installation costs. Full duplex is also assignable.
- ST Terminated Option (-FOST)
- Versatile Link Terminated Option (-FOVP)
- Modbus and DNP 3.0 protocols available

Meter Auto Detects I/O Card Type



Note: I/O cards can be ordered separately - see last page.

100BASE T ETHERNET (INP100S)

Rapid Response™ 100BaseT Ethernet

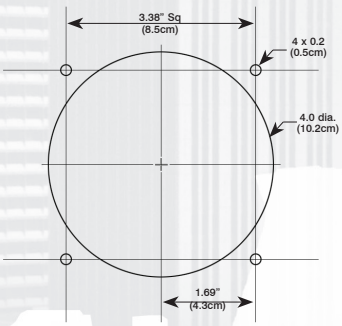
Electro Industries Rapid Response™ Ethernet card allows for high speed Ethernet communication utilizing a 100BaseT protocol communicating with up to 12 connections with Modbus TCP. The card supports a static IP address and is treated like a node on the network. Using Rapid Response™ technology insures that the Shark® 200 meter provides fast and reliable updates to HMI packages, SCADA and COM EXT download software.

Simultaneous Connections to Multiple Software Systems

SHARK® 200 METER ANSI AND DIN MOUNTING

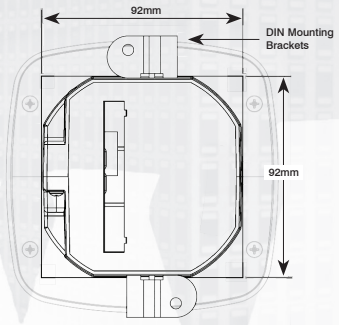
The unit mounts directly in an ANSI C39.1 (4" Round form) or an IEC 92 mm DIN square form. This is perfect for new installations and for existing panels. In new installations, simply use DIN or ANSI punches. For existing panels, pull out old analog meters and replace them with the Shark® 200 meter. The meter uses standard voltage and current inputs so that CT and PT wiring does not need to be replaced.

ANSI Mounting



American

DIN Mounting

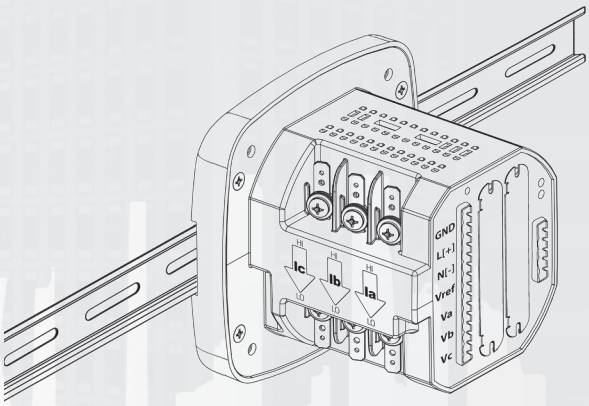


European

(One meter fits both standards)

SHARK® 200T TRANSDUCER

This transducer version of the Shark® 200 meter does not include a display. The unit mounts directly to a DIN rail and provides an RS485 Modbus or DNP 3.0 output and the expandable I/O.



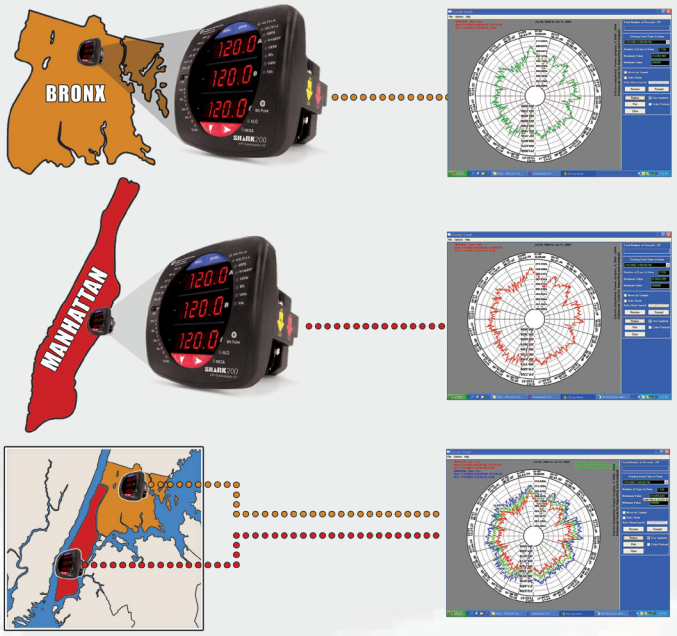
Shark® 200T - DIN Rail Mounted Transducer

Typical Substation Solutions

SUBSTATION VOLTAGE RECORDING

Traditionally, voltage recording meters were relegated to high cost metering or monitoring solutions. The Shark® 200 meter can be placed throughout an electrical distribution network. The meter provides one of the industry's lowest cost methods of collecting voltage information within a Utility power distribution grid.

- **Voltage reliability analysis insuring proper voltage to customers**
- **Compare voltage reliability throughout transmission or distribution networks**
- **Monitor the output of substation transformers or line regulators**
- **Initiate conservation voltage reduction, reducing system demand**



LOAD PROFILING

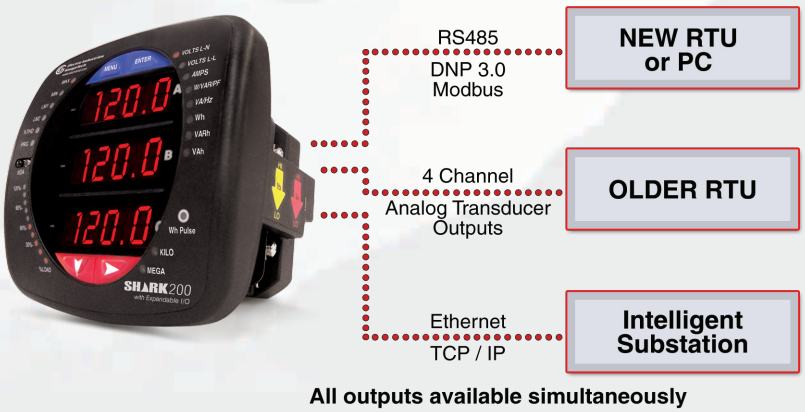
The Shark® 200 meter allows you to log substation data over time with regard to electrical usage, demand, voltage, current, PF and many other parameters. This enables a complete analysis of the power system over time.

- **Provide revenue accurate load profiling**
- **Determine substation usage**
- **Analyze feeder capacity and utilization**
- **Provide time based load profile for planning one estimation**
- **Data trend PF distribution and imbalances for system efficiency analysis**

LOW COST SUBSTATION TELEMETRY

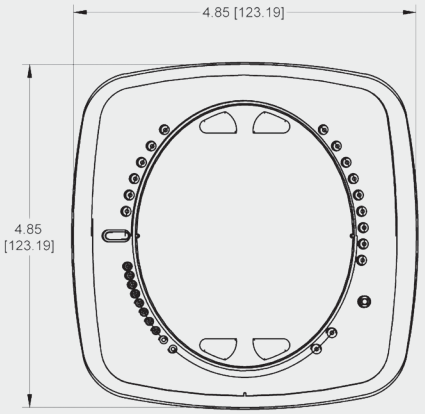
The Shark® 200 meter's advanced output capability brings back data using many different communication mediums such as RS485, Ethernet and analog outputs. This insures that one meter can be used for almost every substation application no matter what communication infrastructure is needed.

- **Perfect for new or retrofit applications**
- **Multiple Com paths**
- **One meter provides outputs for every application**
- **Multiple systems and/or user accessing data simultaneously**

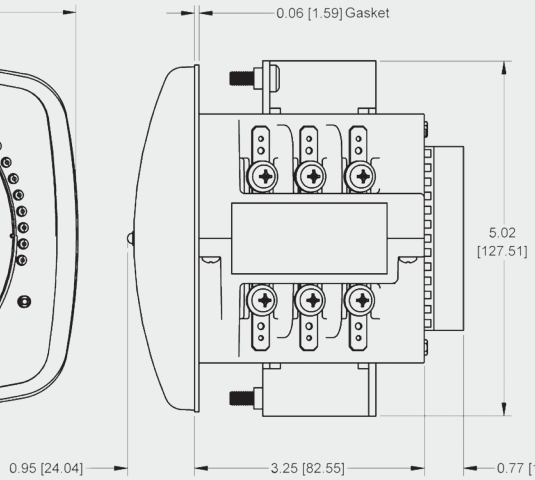


All outputs available simultaneously

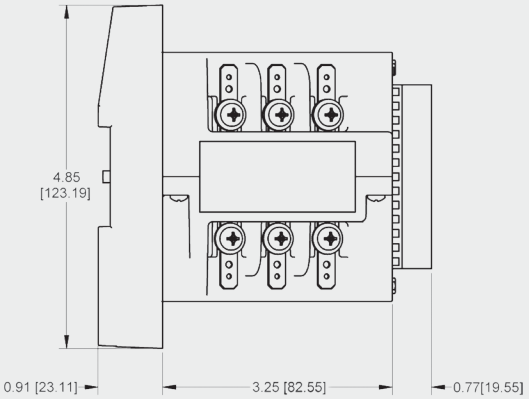
DIMENSIONAL DRAWINGS



Shark® 200 Meter Face



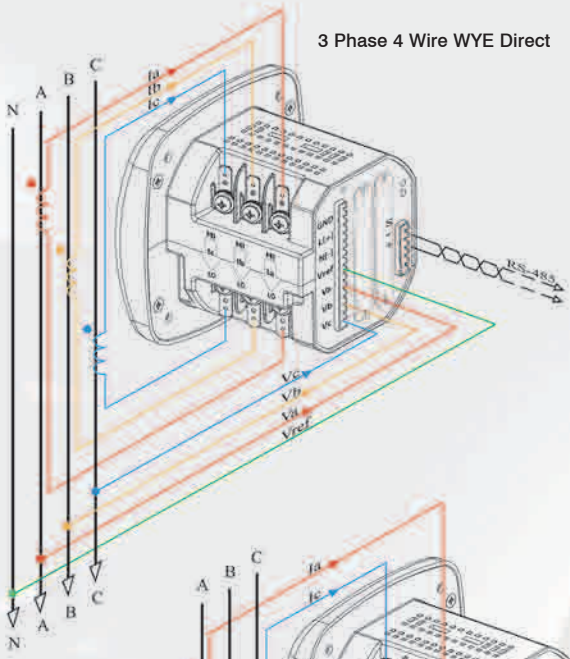
Shark® 200 Meter Side



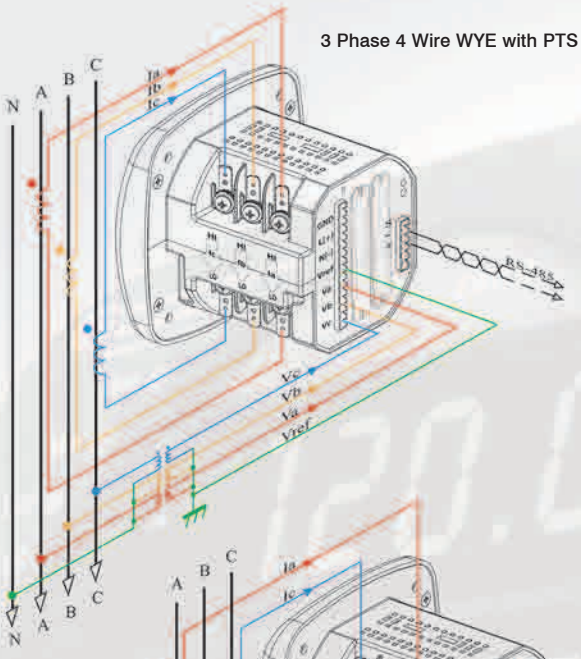
Shark® 200T Transducer Side

WIRING DIAGRAMS

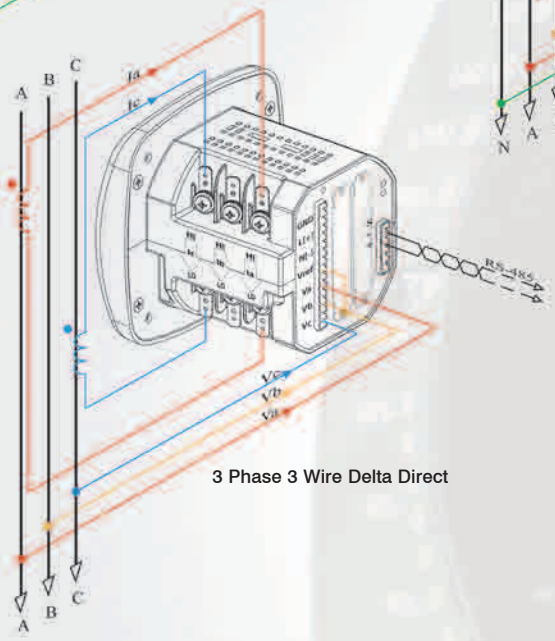
3 Phase 4 Wire WYE Direct



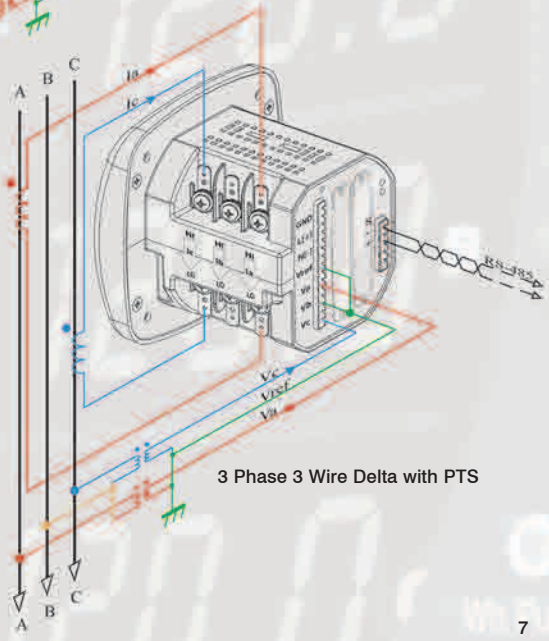
3 Phase 4 Wire WYE with PTS



3 Phase 3 Wire Delta Direct



3 Phase 3 Wire Delta with PTS



Specifications

Voltage Inputs

- 20-576 Volts Line To Neutral, 0-721 Volts Line to Line
- Universal Voltage Input
- Input Withstand Capability – Meets IEEE C37.90.1 (Surge Withstand Capability)
- Programmable Voltage Range to Any PT ratio
- Supports: 3 Element WYE, 2.5 Element WYE, 2 Element Delta, 4 Wire Delta Systems
- Burden: Input Impedance 1 Mega Ohms. Burden 0.014W at 120Volts
- Input wire gauge max (AWG 12 / 2.5mm^2)

Current Inputs

- Class 10: (0.005 to 11) A, 5 Amp Nominal
- Class 2: (0.001 to 2) A, 1A Nominal Secondary
- Fault Current Withstand: 100 Amps for 10 Seconds, 300 Amps for 3 Seconds, 500 Amps for 1 Second
- Continuous current withstand: 20 Amps for Screw Terminated or Pass Through Connections
- Programmable Current to Any CT Ratio
- Burden 0.005VA per phase Max at 11Amps
- Pickup Current: 0.1% of Nominal
  Class 10: 5mA
  Class 2: 1mA
- Pass through wire diameter: 0.177" / 4.5mm

Isolation

All Inputs and Outputs are galvanically isolated to 2500 Volts

Environmental Rating

Storage: (-20 to +70)° C
Operating: (-20 to +70)° C
Humidity: to 95% RH Non-Condensing
Faceplate Rating:
NEMA12
(Water Resistant)
Mounting Gasket Included

Sensing Method

- True RMS
- Sampling at over 400 samples / cycle on all channels of measured readings simultaneously
- Harmonics resolution to 40th order
- Waveform up to 512 samples/cycle

Update Rate

- Watts, VAR and VA-100msec
- All other parameters-1second

Power Supply

Option D2:
- (90 to 265) Volts AC and (100 to 370) Volts DC. Universal AC/DC Supply

Option: D:
- (18-60) Volts DC (24-48 VDC Systems)

Burden: 10VA Max

Standard Communication Format

- 2 Com Ports (Back and Face Plate)
- RS485 Port (Through Back Plate)
- IrDA (Through Faceplate)
- Com Port Baud Rate: (9,600 - 57,600)
- Com Port Address: 1-247
- 8 Bit, No parity
- Modbus RTU, ASCII or DNP 3.0 Protocols

KYZ Pulse

- Type Form C Contact
- On Resistance: 35 Ohms Max
- Peak Voltage: 350 VDC
- Continuous Load Current: 120mA
- Peak Load Current: 350mA (10ms)
- Off State Leakage Current @ 350VDC: 1uA

Dimensions and Shipping

- Weight: 2 lbs
- Basic Unit: H4.85 x W4.85 x L4.65
- Shark® 200 meter mounts in 92mm DIN & ANSI C39.1 Round Cut-outs
- Shark® 200T Transducer DIN rail mounted
- 2-inch DIN Rail Included
- Shipping Container Dimensions: 6" cube

Meter Accuracy

- See page 3
- *Note: Accuracy specs doubled for 2.5 Element connections (less accurate).*

Compliance:

- IEC 687 (0.2% Accuracy)
- ANSI C12.20 (0.2% Accuracy)
- ANSI (IEEE) C37.90.1 Surge Withstand
- ANSI C62.41 (Burst)
- IEC1000-4-2 – ESD
- IEC1000-4-3 – Radiated Immunity
- IEC 1000-4-4 – Fast Transient
- IEC 1000-4-5 – Surge Immunity

Ordering Information

All fields must be filled in to create a valid part number.

	Model		Frequency		Current Input		V-Switch Pack		Power Supply		I/O Slot 1*		I/O Slot 2*
Option Numbers:		–		–		–		–		–		–	
Example:	**Shark200**	-	-60	-	-10	-	-V2	-	-D2	-	-INP100S	-	-X

Model	Frequency	Current Input	V-Switch Pack	Power Supply	I/O Slot 1*	I/O Slot 2*
Shark200 (Meter/Transducer)	-50 50 Hz System	-10 10 Amp Secondary	-V1 Multifunction Meter Only	-D2 90-265V AC/DC	-X None	-X None
Shark200T (Transducer Only)	-60 60 Hz System	-2 2 Amp Secondary	-V2 Standard Data-Logging Memory	-D 18-60V DC	-RO1S 2 Relays / 2 Status	-RO1S 2 Relays / 2 Status
			-V3 Power Quality Harmonics		-PO1S 4 Pulses / 4 Status	-PO1S 4 Pulses / 4 Status
			-V4 Limits & Control		-1mAOS 4 channel Analog Output 0-1 (bidirectional)	-1mAOS 4 channel Analog Output 0-1 (bidirectional)
			-V5 64 Samples/cycle Waveform Recording		-20mAOS 4 Channel Analog Output 4-20mA	-20mAOS 4 Channel Analog Output 4-20mA
			-V6 512 Samples/cycle Waveform Recording		-FOSTS Fiber Optic Output ST Terminated	-FOSTS Fiber Optic Output ST Terminated
					-FOVPS Fiber Optic Output VPIN Terminated	-FOVPS Fiber Optic Output VPIN Terminated
					-INP100S 100BaseT Ethernet	-INP100S 100BaseT Ethernet

** I/O cards can be ordered separately using the above part numbers.*

Additional Accessories

Communication Converters

9PINC – RS232 Cable

CAB6490 - USB to IrDA Adapter

Unicom 2500 - RS485 to RS232 Converter

Unicom 2500-F – RS485 to RS232 to Fiber Optic Converter

Modem Manager, Model #, MM1 – RS485 to RS232 Converter for Modem Communication

IrDA232 - IrDA to RS232 Adapter for Remote Read

Compliance Documents

Certificate of Calibration, Part #: CCal – This provides Certificate of Calibration with NIST traceable Test Data.

Current Transformer Kits

CT200K – 200/5 Ratio .94" Window 3 CTs
CT400K – 400/5 Ratio, 1.25" Window, 3 CTs
CT800K – 800/5 Ratio, 2.06" Window, 3 CTs
CT2000K – 2000/5 Ratio, 3.00" Window, 3 CTs

CT Specifications:

Frequency: 50 to 400Hz; Insulation: 600 Volts, 10kV BIL
Flexible Leads: UL 1015 105°C, CSA Approved, 24" Long, #16AWG

Software Option Numbers

COMEXT3 – CommunicatorEXT 3.0 for Windows®

* Consult factory application engineer for additional transformer ratios, types or window sizes.

Electro Industries/GaugeTech
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